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| (54) Title: EDIBLE FAT-CONTAINING PRODUCTS (57) Abstract Mixtures of specific liquid and solid polyol fatty acid polyesters are believed to exhibit a favourable rheology and/or favourable anti anal leakage properties, and/or improved mouthfeel. | | |

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EDIBLE FAT-CONTAINING PRODUCTS

5 The present invention relates to edible fat-containing products comprising an indigestible fat-replacer.

In this specification, unless otherwise indicated, the term 'fat' refers to edible fatty substances in a general sense, including natural or synthesized fats and oils consisting essentially of triglycerides such as, for example, soybean oil, sunflower oil, palm oil, coconut oil, fish oil, lard and tallow, which may have been partially or completely hydrogenated or modified otherwise, as well as non-toxic fatty materials having properties similar to triglycerides, herein referred to as fat-replacers, which materials may be partially or fully indigestible. The terms fat and oil are used interchangeably.

20 Over the last decade many non-triglyceride fatty substances have been described as potential fat-replacers in food products. Examples thereof are waxes, e.g. jojoba oil and hydrogenated jojoba oil, polysiloxanes, acylated glycerides, polyalkoxyglycerolethers, dicarboxylic acid esters, polyol fatty acid polyesters and the epoxy extended derivatives thereof. Examples of disclosures of fat-replacers are e.g. DD 207 070, Journal of Food Science 49, 419-428 (1984), US 3,600,186, US 4,005,195, US 4,005,196, US 4,034,083, US 4,582,715, US 4,582,927, EP 0 233 856, EP 0 236 288, EP 0 235 836 and EP 0 254 547.

In particular polyol fatty acid polyesters, and more specifically the sugar fatty acid polyesters, such as e.g. the sucrose fatty acid polyesters, are receiving increased attention as low-calorie fat-replacers in edible products. Substantially indigestible for human beings they have physical and organoleptic properties very similar to

triglyceride oils and fats conventionally used in edible products.

Polyol fatty acid polyesters are also reported to have use as pharmaceutical agents e.g. in view of their ability to take up fat-soluble substances, such as in particular cholesterol, in the gastro-intestinal tract, and subsequently remove those substances from the human body.

Suitable polyol fatty acid polyesters are derived from aliphatic or aromatic polyols which comprise at least four free hydroxyl groups. Such polyols in particular include the group of sugar polyols, which comprises the sugars, i.e. the mono-, di- and polysaccharides, the corresponding sugar alcohols and the derivatives thereof having at least four free hydroxyl groups. Examples of sugar polyols include glucose, mannose, galactose, xylose, fructose, sorbose, tagatose, ribulose, xylulose, maltose, lactose, cellobiose, raffinose, sucrose, erythritol, mannitol, lactitol, sorbitol, xylitol and alpha-methylglucoside. A particularly preferred polyol is sucrose.

The term 'polyol fatty acid polyester' is intended to refer to any such polyesters or mixtures thereof which have a degree of conversion of 70 % or more, i.e. of which, on an average, 70 % or more of the polyol hydroxyl groups have been esterified with fatty acids. Preferred polyol fatty acid polyesters for use in the present invention have degrees of conversion of 85 % or more, or even 95 % or more.

The fatty acid residues in the polyol fatty acid polyesters may be derived from naturally occurring or synthetic fatty acids per se, or suitable sources thereof, such as natural triglyceride fats and oils or their corresponding lower-alkyl esters. The fatty acids may be saturated or unsaturated, branched or straight fatty acids containing from 8 to 24 carbon atoms, in particular 12 to 18 carbon atoms, such as

lauric, myristic, palmitic, stearic, oleic, elaidic, and linoleic acids. Suitable natural sources are the vegetable oils, such as sunflower, safflower, rapeseed, cottonseed, palm kernel, palm and soybean oils. Also other oils, for example marine oil or animal oil may be used. If so required, conventional techniques may be used to first introduce the necessary degree of saturation. Suitable such techniques include full or partial hydrogenation, interesterification, and fractionation, and may be used before or after conversion to the polyol fatty acid polyesters.

Two problems sometimes occur with low calorie food containing polyol fatty acid polyesters: if liquid polyol fatty ester acids are used this may result in undesired anal leakage problems, while if more solid polyol fatty esters are used this may provide an undesirably waxy mouthfeel. Other problems sometimes encountered with polyol fatty acid polyesters concern the rheology of the material, the availability of the materials from which the polyol fatty acid esters are made and the complicated processing to prepare polyol fatty acid esters.

EP 233,856 (P&G) discloses the use of intermediate melting polyol fatty acid polyesters for reducing problems of anal leakage and mouthfeel. However, food products fried in these intermediate melting polyol fatty acid polyesters, still have a more waxy mouthfeel than products fried in triglyceride frying media.

Another method to reduce the anal leakage and mouthfeel problems is to use a polyol fatty acid polyester blend consisting of a liquid polyol fatty acid polyester and a solid -hardstock- polyol fatty acid polyester, optionally in combination with digestible fatty materials such as triglycerides.

WO 91/15960 (P&G) discloses specific hardstock materials which may be used in blends of liquid and solid polyol fatty acids. These hardstock materials contain high levels of C₂₀ or higher saturated fatty acid materials. Similar hardstock materials are disclosed in WO 91/15961, WO 91/15963 and WO 91/15964 (P&G).

WO 91/15962 discloses the use of from 10 to 40% of solid polyol fatty acid polyester materials in combination with 60 to 90% liquid non-digestible oils. Preferred solid materials comprise 84.8% of saturated C₁₈ fatty acids.

It has now been found that other suitable combinations of liquid indigestible fatty materials and solid polyol fatty acid polyesters can be obtained. In particular it has been found that advantageous combinations of liquid and solid polyol fatty acid polyesters satisfy one or more of a set of specific conditions.

Accordingly the present invention relates to an edible composition comprising fatty substances, said fatty substances comprising a mixture comprising from 60-99% by weight of the mixture of liquid polyol fatty acid polyesters and from 1-40% by weight of the mixture of solid polyol fatty acid polyesters, characterised in that one or more of the following requirements are satisfied:

(a) the solid polyol fatty acid polyester contains at least 10 wt% of C₁₂₋₁₈ saturated fatty acid residues and the solid polyol fatty acid polyester has a beta-prime crystal morphology;

(b) the solid polyol fatty acid polyester is present at a level of less than 20% by weight of the mixture and has an average particle size of less than 20 μ m;

(c) the fatty substances of the composition, together have a thixotropic area of less than 200,000 Pa/s, and the solid polyol fatty acid polyester comprises at least 10 wt% of C₁₂₋₁₈ saturated fatty acid residues, the weight ratio of C₁₆ to C₁₈ saturated fatty acid residues being from 5:1 to 1:5;

(d) the fatty substances of the composition, together have a thixotropic area of more than 200,000 Pa/s, and the solid polyol fatty acid polyester comprises at least 10 wt% of C₁₂₋₁₈ saturated fatty acid residues, and the wt% of C₁₈ saturated fatty acid residues in the solid polyol fatty acid polyester is less than 90 wt%;

(e) the level of solid polyol fatty acid polyesters is from 1 to 9% by weight of the mixture and the solid polyol fatty acid polyester material comprises at least 10 wt% of C₁₂₋₁₈ saturated fatty acid residues.

For the purpose of this invention, throughout this specification wt% for the fatty acid residues are based on the total weight of fatty acid residues in the solid polyol fatty acid polyester material.

Edible compositions in accordance to the invention comprise fatty substances. As indicated above the term fatty substance refers to edible fatty substances which may be fully or partially indigestible. Apart from the liquid and solid polyol fatty acid polyesters as defined hereinbelow, compositions of the invention may comprise digestible fatty substances such as triglyceride materials and non-glyceride fatty substances.

The level of these fatty substances other than the polyol fatty acid polyesters may be up to 90 wt%, based on the total weight of the fatty substances, preferably, however the level

is from 0-40 wt%, more preferred 0-10 wt%, most preferred edible compositions of the invention are substantially free from fatty substances other than polyol fatty acid polyesters.

5

Depending on the type of edible composition, the total level of fatty substances in the edible composition of the invention may be from 1-100 wt%, for example 5-95 wt%. Some edible compositions like shortenings, chocolate and dressings
10 may comprise relatively high levels of fatty substances, for example 30-90 wt%. Other edible compositions like sauces, soups, bakery products etc may comprise lower levels of fatty substances for example 1-30 wt%.

15 In any case, the fatty substances which are present in the edible compositions of the invention comprise a mixture of liquid and solid polyol fatty acid polyester materials, the level of liquid polyol fatty acid polyesters in the mixture being from 60-99 wt%, more preferred 70-97 wt%, most
20 preferred 80-95 wt% and the level of solid polyol fatty acid polyesters being from 1-40 wt%, more preferred 3-30 wt%, most preferred 5-20 wt%, the percentages being based on the total weight of the mixture of liquid and solid polyol fatty acid polyesters.

25

The liquid polyol fatty acid polyester material may be any material which in physical properties and rheology behaves similar to conventional liquid materials and which has a complete melting point below 35°C, more preferred below 30°C,
30 most preferred less than 20°C. Examples thereof are given in the examples. Also mixtures of liquid polyol fatty acid polyesters may be used as the liquid component of the mixture.

35 The solid fatty acid polyester material may be any material satisfying one or more of the requirements of the invention

and which has a complete melting point above 35°C, more preferred above 40°C most preferred above 45°C. Examples of solid materials are given in the examples. Also mixtures of solid polyol fatty acid polyesters may be used.

5

The mixture of liquid and solid polyol fatty acid polyesters hence is preferably characterised by the presence of at least two peaks as measured with differential scanning calorimetry, one of the peaks below 35°C and one of the peaks above 35°C, 10 more preferably one peak below 30°C and one above 40°C, most preferred one peak below 25°C and one above 45°C.

The optional conventional fat-component may be triglyceride oils or fats of animal or vegetable origin. Suitable 15 conventional triglyceride fats and oils include, optionally partially or fully hydrogenated, coconut oil, palmkernel oil, palm oil, marine oils, lard, tallow fat, butter fat, cocoa butter fat, soybean oil, safflower oil, cotton seed oil, rapeseed oil, corn oil sunflower oil and mixtures thereof.

20

In any case at least one of the conditions (a) to (e) as indicated above are satisfied.

In a first aspect of the invention, the solid polyol fatty 25 polyester contains at least 10 wt% of C₁₂₋₁₈ saturated fatty acid residues and the solid fatty acid has a beta-prime crystal morphology. Although applicants do not wish to be bound by any theory it is believed that these particular solid polyol fatty acid polyester materials comprising a 30 minimum amount of saturated C₁₂₋₁₈ fatty acid residues and which exhibit beta-prime morphology are particularly advantageous because these materials are believed to be capable of network formation in the liquid /solid mixtures, therewith providing anti-leakage properties and/or improved 35 rheology.

Preferably the level of saturated C₁₂₋₁₈ fatty acid residues in the solid polyol fatty acid polyester is from 10-100 wt%, more preferred 60-100%, most preferred 80-100%.

- 5 The solid polyol fatty acid polyester has a beta-prime morphology. For the purpose of this invention this means that beta prime morphology can be shown to be present with conventional techniques. Preferably at least 10 wt%, more preferred more than 25%, most preferred from 50-100% of the
10 solid polyol fatty acid polyester is present in the form of beta-prime crystals. The presence of these crystals can be detected by known techniques such as X-ray diffraction.

- In a second embodiment of the invention the solid polyol
15 fatty acid polyester material is present at a level of less than 20% by weight of the mixture of polyol fatty acid ester materials, more preferred from 2-15%, most preferred from 3-10% and has an average particle size of less than 20 μ m, more preferred from 0.01 to 10 μ m, most preferred from 0.1 to 7
20 μ m. It is believed that these relatively low levels of solid polyol fatty acid polyester materials combined with their small particle size, again give rise to the formation of a network structure in the liquid/solid mixtures of the invention therewith providing anti-leakage properties and/or
25 improved rheology and/or improved non-waxy mouthfeel and/or reduced graininess. It is believed that higher levels of these small size solid polyol fatty acid polyester materials are less preferred, because they may result in too hard fatty substances. The average particle size can advantageously be
30 measured by conventional techniques, such as light microscopy; preferably prior to measurement of the particle size the sample is subjected to moderate shear for temporarily breaking up a network system that might eventually be present.

35

In a third embodiment of the invention the fatty substances of the composition, together have a thixotropic area of less than 200,000 Pa/s (preferred 10,000 to 100,00, more preferred 15,000 to 50,000 Pa/s), and the solid polyol fatty acid polyester comprises at least 10 wt%, more preferred 20-90%, most preferred 30-80% of C₁₂₋₁₈ saturated fatty acid residues, the weight ratio of C₁₆ to C₁₈ saturated fatty acid residues being from 5:1 to 1:5. In this context it is believed that should the fatty substances of the composition together have a relatively low thixotropic area, then the network formation to provide good rheology and/or mouthfeel and/or anti-leakage is best safeguarded if the level of C₁₂₋₁₈ saturated fatty acid residues in the solid polyol fatty acid polyester is at least 10 wt% and the ratio of C₁₆ to C₁₈ is from 5:1 to 1:5 more preferred from 3:1 to 1:3, most preferred 2:1 to 1:2. The thixotropic area of the composition can be determined by any conventional method, preferably the method as described in WO 91/15962 is used. Another preferred method is described in the examples.

20

In a fourth aspect of the invention the fatty substances of the composition, together have a thixotropic area of more than 200,000 Pa/s, and the solid polyol fatty acid polyester comprises at least 10 wt% more preferred 20-90%, most preferred 30-80% of C₁₂₋₁₈ saturated fatty acid residues, and the wt% of C₁₈ saturated fatty acid residues in the solid polyol fatty acid ester material is less than 90 wt%, more preferred less than 87%, most preferred less than 80% of the fatty acid ester residues. In this context it is believed that should the fatty substances of the composition, together have a relatively high thixotropic area, then the network formation to provide good rheology and/or mouthfeel and/or anti-leakage is best safeguarded if the level of fatty acid residues in the solid polyol fatty acid polyester of C₁₂₋₁₈ saturated fatty acids is at least 10 wt%, provided the level of C₁₈ saturated fatty acid residues is less than 90 wt%.

In a fifth aspect of the invention the level of solid polyol fatty acid polyesters is from 1 to 9% by weight of the mixture of polyol fatty acid polyester materials and the solid polyol fatty acid polyester material comprises at least 5 10 wt%, more preferred 20-80%, most preferred 30-70% of C₁₂₋₁₈ saturated fatty acid residues. It is believed that these relatively low levels of solid polyol fatty acid polyesters with relatively high levels of C₁₂₋₁₈ saturated fatty acids are capable of providing advantageous network properties 10 resulting in good rheology and/or anti-leakage and/or non-waxy mouthfeel.

According to the third-fifth embodiments as described above, the solid polyol fatty acid polyester comprises a certain 15 minimum level of saturated fatty acid residues. For some applications, however it may be advantageous to use -within the constraints as given - fairly high levels of unsaturated fatty acid residues. For some applications the level of unsaturated fatty acid residues in the solid polyol fatty 20 acid ester may in theory be up to 100%, although generally lower levels, for example 0-60 wt% or 10-40 wt% will be used.

In another preferred embodiment of the invention the level of C₂₀ or higher fatty acid residues in the solid polyol fatty 25 acid polyester is preferably less than 60 wt%, more preferred less than 40%, most preferred from 0-10%.

Preferred embodiments of the invention relate to compositions satisfying two or more of the above mentioned conditions. For 30 example preferred edible compositions satisfy at least one requirement of the group of (a) and (b) plus at least one requirement of the group of (c), (d) and (e). Especially preferred are compositions satisfying both requirements (a) and (b), most preferred in combination with at least one of 35 the requirements of (c), (d) and (e).

- In terms of rheology the selection of the appropriate fat-replacer or mixture of fat-replacer and conventional fat strongly depends upon the particular application envisaged, and may range of fat-replacers having a fully fluid rheology
- 5 to replace liquid oils in e.g. salad, frying or seasoning oils, to more viscous or even solid rheology in compositions having a more structured fat phase such as margarines, spreads, shortenings and confectionery products.
- 10 The present invention is not specific to edible fat-containing compositions in any particular food area. It may be suitably be applied to food products such as spreads, margarines, creams, salad oils, frying oils, shortenings, bakery products such as doughs, cakes and biscuits, fried and
- 15 snack products, fresh, hard and processed cheeses, meat emulsions, mayonnaise and dressings, confectionery products, such as desserts, fillings, chocolates, candies, chews, and ice-creams.

Example I

In the examples the following liquid polyol fatty acid ester is used:

| | spe1 |
|-------------------|---------|
| 5 Fatty acid | weight% |
| Lauric acid | 0.2 |
| Myristic acid | 0.2 |
| Palmitic acid | 11.8 |
| Stearic acid | 8.6 |
| 10 Arachidic acid | 0.3 |
| Oleic acid | 53.8 |
| Elaidic acid | - |
| Linoleic acid | 22.9 |
| Linolenic acid | 1.0 |
| 15 others | 1.2 |

The octaester content of this material is 78.1%, the OH value 6.1 and the clearpoint as measured with DSC of about 20°C.

20 The following solid polyol fatty acid polyesters are used:

| | spe2 | spe3 | spe4 | spe5 |
|-------------------|----------------|------|------|------|
| <u>Fatty acid</u> | <u>weight%</u> | | | |
| Caprylic acid | - | - | - | 18.5 |
| 25 Lauric acid | 0.3 | 0.3 | 0.1 | 0.1 |
| Myristic acid | 0.3 | 1.4 | 8.3 | 0.1 |
| Palmitic acid | 12.5 | 48.9 | 28.8 | 39.4 |
| Stearic acid | 86 | 48.9 | 24.5 | 41.6 |
| Arachidic acid | 0.5 | 0.4 | 23.1 | 0.2 |
| 30 Oleic acid | - | - | - | - |
| Elaidic acid | - | 0.1 | - | - |
| Linoleic acid | - | - | - | - |
| Linolenic acid | - | - | - | - |
| Behenic acid | - | - | 12.1 | - |
| 35 others | 0.4 | 0.3 | 3.1 | 0.1 |

Spe 2 has a OH value of 3.4 and a clearpoint (DSC) of 59.5°C; spe3 has a OH-value of 4.1 and a clearpoint (DSC) of 55 °C.

Example II

- 5 A mixture of 90 wt% of spel and 10 wt% spe2 is plastized in 2 scraped tubular surface heat exchangers (A-units). The A-units had a volume of 18 ml, a split of 3 ml and 2 scraper blades. The speed of the rotating blades amounted to 500 rpm, at a throughput of 3 kg/hr. The system is cooled to have an
10 outlet temperature of the first A-unit of 41°C and 20°C for the second A-unit. The average particle size as determined by light microscopy (sample of 0.01 mm thickness prepared in a 0.01 m Leitz culture chamber, measured with polarized light at ambient temperature magnification 100 times, resolution
15 about 1 μm) was less than 10 μm (estimated 4-6 μm).

The thixotropic area of the sample at 33.3 °C was significantly less than 200,000 Pa/s and was determined as follows:

- 20 The sample is tempered by pouring 5 g of fatty substance after melting in glass-tubes (diameter 10 mm, wall thickness 1 mm) followed by heating to 80°C for 30 minutes. The heated sample is then cooled in a water bath of 5°C until a temperature is reached of 29.4°C. The cooled sample is then
25 stored for 1 week at 21.1°C. The thixotropic area of the sample is then determined as follows: The viscometer is kept at 33.3°C, the temperature of the sample is adjusted to this temperature. The shear rate is linearly increased from 0 s^{-1} to 800 s^{-1} in 2 minutes and then reduced back to 0 s^{-1} in
30 another 2 minutes in a Ferranti Shirley viscometer. The thixotropic area is the area encompassed by the hysteresis loop in the shear rate versus the shear stress plot.

Example III

Example II was repeated when using a mixture of 90% spe1 and 10% of spe3. Again the average particle size of the hardstock material was less than 10 μm and the thixotropic area was far less than 200,000 Pa/s.

Example IV

A mixture of 92 wt% spe1 and 8 wt% spe3 was prepared and crystallised by cooling to 20°C with tap water in a stirred vessel (content 50g). The thixotropic area was determined as in example II and was far less than 200,000 Pa/s. Similar results were obtained for mixtures of 92 wt% spe1 and 8 wt% spe4 or spe5., and mixtures of 70% spe1 and 30% of spe2 or spe3.

Example V

A mixture of 73 wt% of trans-hardened soybean oil (slip melting point 36°C), 4% fully hardened palm oil, 21 wt% spe1 and 2 wt% spe3 was prepared. The thixotropic area was determined as in example II and was significantly more than 200,000 Pa/s.

Similar results were obtained with the following mixtures:

- (a) 63 wt% trans-hardened palm oil, (slip melting point 44°C), 4 wt% fully hardened palm oil, 31 wt% spe1 and 2 wt% spe3.
- (b) 63 wt% trans-hardened palm oil (slip melting point 44°C), 2 wt% fully hardened palm oil, 33 wt% spe1 and 2 wt% spe3.
- (c) 63 wt% trans-hardened palm oil (slip melting point 44°C), 35 wt% spe1 and 2 wt% spe3.

Example VI

A sample of sucrose octastearate was crystallised into beta prime structure, according to the method as described in
5 Jandacek and Webb, Chemistry and Physics of Lipids (1978)
163-176.

A mixture was prepared of 65 wt% spel and 35 wt% of the
sucrose octastearate. The mixture is evaluated by X-ray
10 diffraction and shows beta prime crystal morphology.

CLAIMS

1. An edible composition comprising fatty substances, said fatty substances comprising a mixture comprising from 60-99% by weight of the mixture of liquid polyol fatty acid esters and from 1-40% by weight of the mixture of solid polyol fatty acid esters, characterised in that one or more of the following requirements are satisfied:
- (a) the solid polyol fatty acid polyester contains at least 10 wt% of C₁₂₋₁₈ saturated fatty acid residues and the solid polyol fatty acid polyester has a beta-prime crystal morphology;
- (b) the solid polyol fatty acid polyester is present at a level of less than 20% by weight of the mixture and has an average particle size of less than 20 μ m;
- (c) the fatty substances of the composition, together have a thixotropic area of less than 200,000 Pa/s, and the solid polyol fatty acid polyester comprises at least 10 wt% of C₁₂₋₁₈ saturated fatty acid residues, the weight ratio of C₁₆ to C₁₈ saturated fatty acid residues being from 5:1 to 1:5;
- (d) the fatty substances of the composition, together have a thixotropic area of more than 200,000 Pa/s, and the solid polyol fatty acid polyester comprises at least 10 wt% of C₁₂₋₁₈ saturated fatty acid residues, and the wt% of C₁₈ saturated fatty acid residues in the solid polyol fatty acid polyester is less than 90 mole%;
- (e) the level of solid polyol fatty acid polyesters is from 1 to 9% by weight of the mixture and the solid polyol fatty acid polyester material comprises at least 10 wt% of C₁₂₋₁₈ saturated fatty acid residues.

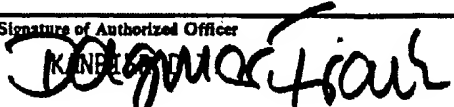
2. Edible composition according to claim 1, wherein at least two of the requirements (a)-(e) are satisfied.

3. Edible composition according to claim 1 or 2 , wherein
5 the fatty substances comprise from 10-100% of polyol fatty acid esters.

INTERNATIONAL SEARCH REPORT

PCT/EP 92/01429

International Application No.

| | | |
|---|--|-------------------------------------|
| I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶ | | |
| According to International Patent Classification (IPC) or to both National Classification and IPC | | |
| Int.Cl. 5 A23D9/00; | A23L1/308; | A23G3/00; A23G9/02 |
| II. FIELDS SEARCHED | | |
| Minimum Documentation Searched ⁷ | | |
| Classification System | Classification Symbols | |
| Int.Cl. 5 | A23D ; A23L | |
| Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸ | | |
| III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹ | | |
| Category ¹⁰ | Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹² | Relevant to Claim No. ¹³ |
| X | EP,A,0 375 027 (THE PROCTER & GAMBLE COMPANY) 27 June 1990 | 1,3 |
| Y | see page 2, line 39 - page 3, line 8; claims 1,3,5-10 see page 7, line 3-6 see page 9, line 22 - line 26 --- | 1-3 |
| P,Y | WO,A,9 115 964 (THE PROCTER & GAMBLE COMPANY) 31 October 1991 cited in the application see page 7, line 12 - page 8, line 10; claims 1-3 see page 10, line 28 - page 11, line 14 see page 14, line 23 - line 25 --- | 1-3 |
| -/-- | | |
| <p>¹⁰ Special categories of cited documents :</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"A" document member of the same patent family</p> | | |
| IV. CERTIFICATION | | |
| Date of the Actual Completion of the International Search | Date of Mailing of this International Search Report | |
| 19 AUGUST 1992 | 09. 09. 92 | |
| International Searching Authority | Signature of Authorized Officer | |
| EUROPEAN PATENT OFFICE |  | |

| III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET) | | |
|--|--|-----------------------|
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